U. S. Air Force

Integrity - Service - Excellence

DoD Architecture Framework Executive Seminar

U.S. AIR FORCE

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Air Force Institute of Technology

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Topics

- Architecture Overview
- DoD Architecture Framework (DoDAF)
  - Background
  - Architecture Products—AOC Example
- Relevance to Requirements and Acquisition

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Architecture Overview

Why are we here?

What is an Architecture?

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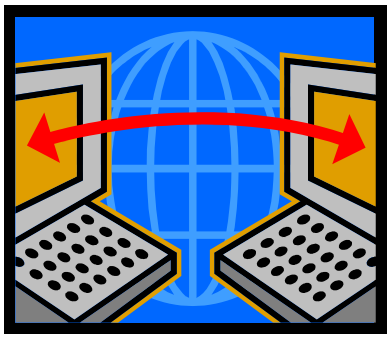
"The structure of components, their relationships, and the principles and guidelines governing their design and evolution over time."
- IEEE STD 610.12 as stated in the *DoD Architecture Framework (DoDAF)*



Architecture is useful for designing unprecedented, complex systems

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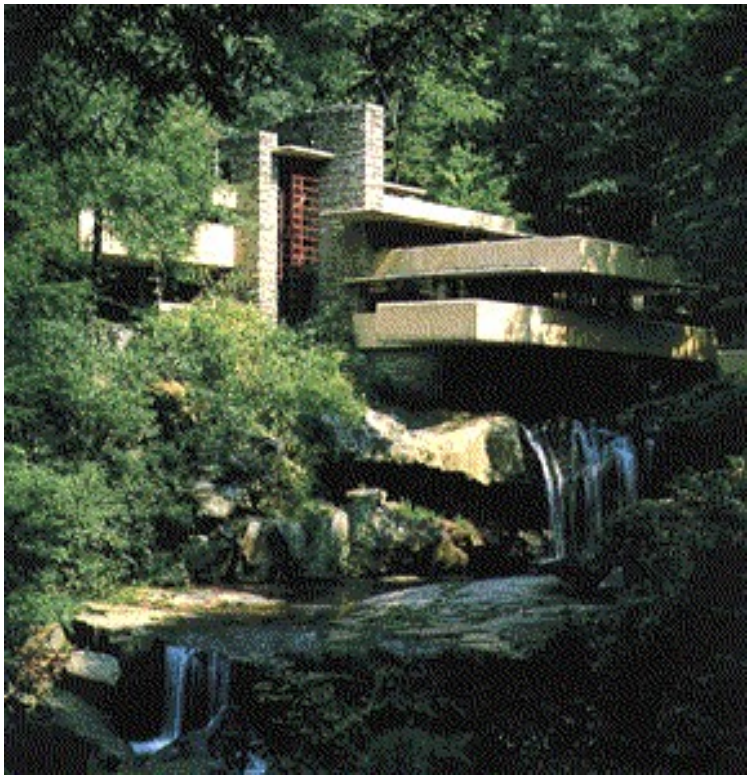
Architecting a House

- When do you NOT need an architect?
  - Simple site
  - Existing design
  - Existing subdivision
- When do you need an architect?
  - Difficult site
  - Unique design
  - “Oneness” with the setting (i.e. integration)



- But, when do you REALLY need an architect?

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When do you need an Architect?

Planned community

- **Integrated services**
- **Interoperable systems**
- **Efficient operations**
- **Complementary facilities**

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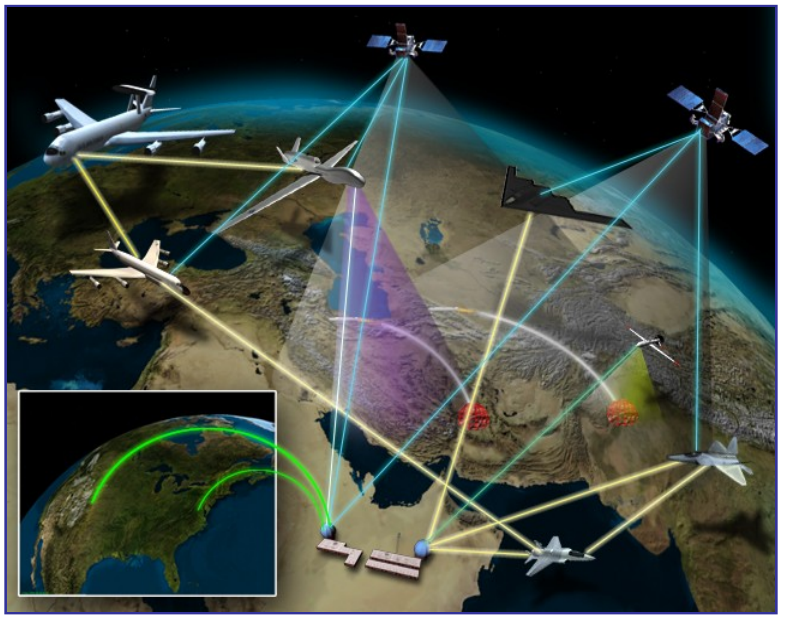
USAF's Planned Community



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An Architecture has Multiple Views*

- Three major views (or perspectives) logically combine to describe an architecture
  - Operational View (OV)
  - Systems View (SV)
  - Technical Standards View (TV)
- Views provide different perspectives on the same architecture

*As Defined in the DoD Architectural Framework (DoDAF)

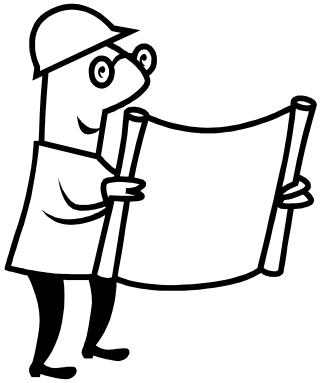
Operational View (OV)

- The Citizens have the Operational View
- A Community operates as:
  - Place to work, shop, entertain, …
  - Place to raise a family
  - Place to help neighbors
  - Place to call home

- For the Citizens, the focus is on the ConOps; the infrastructure is taken for granted; the systems are expected to seamlessly interact and inter-operate

Systems View (SV)

- The Builder has the Systems View
- A Community is a system of systems:
  - Electrical
  - Water & Sewer
  - Communications
  - Roads
  - Etc.



- For the Builder, the Community's infrastructure is the main focus; the various systems and sub-systems must be carefully spec'ed, designed, and installed

Technical Standards View (TV)

- The Builder and the Inspector have the Technical View
- Homes must comply with building codes and standards:
  - National Electrical Code
  - ANSI building standards
  - IEEE electronics standards
- Codes, specs, and standards provide the foundation upon which every process and system in the Community is based

Summary of Views and Constraints

- **Operational View (Citizen)**
  - **Intended Uses and Processes**
  - **Conceptual**

- **System View (Builder)**
  - **Physical Structure**
  - **Design Principles, Reference Models and Rules**
  - **Logical**

- **Technical Standards View (Builder and Inspector)**
  - **Building Codes / Standards**
  - **Standardization (Components)**
  - **Physical**

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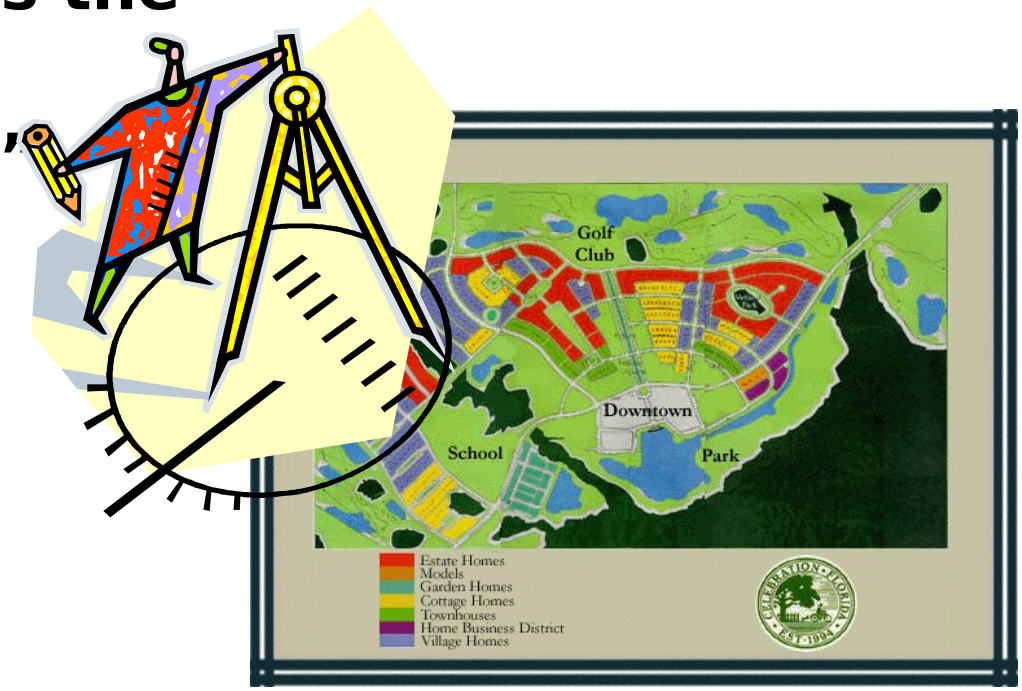
All View (AV)

- The <u>Architect</u> has the All View
- The "Big Picture"
  - Scope
  - Purpose
  - Intended users
  - Environment
  - Etc.



- The Architect must understand all the overarching aspects that relate to all three of the views

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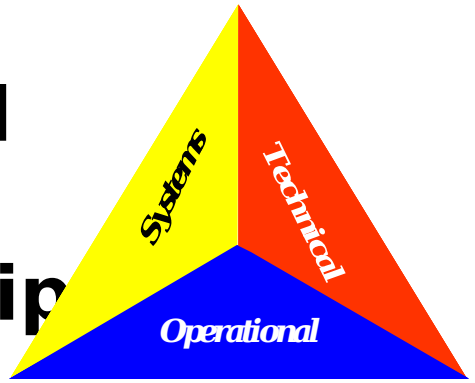
What is the DoD Architecture Framework?

Framework is partitioned into three volumes:

- **Volume I: Definitions and Guidelines**
- **Volume II: Product Descrip**
- **Volume III: Deskbook**



Purpose of the DoD Architecture Framework, Version 1.0, is to:

Define a common approach for developing, presenting, and

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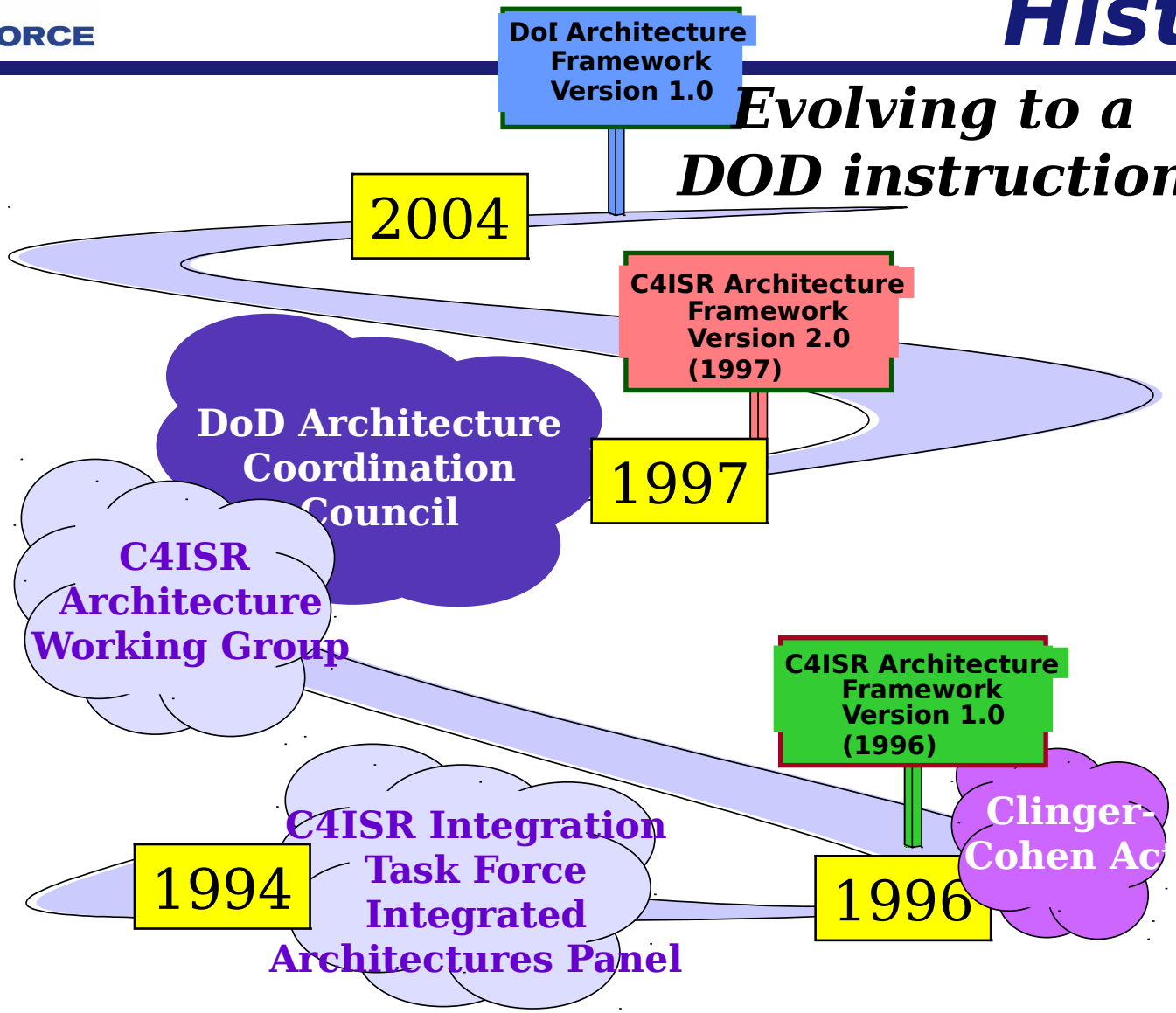
Framework History

Evolving to a DOD instruction



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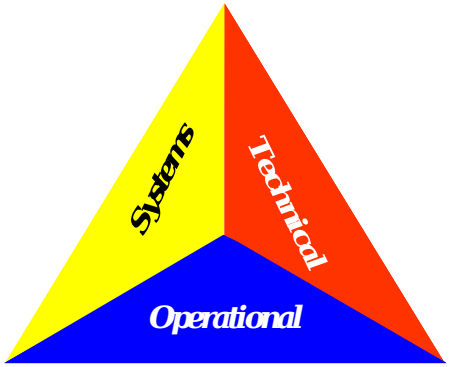
DoD Architecture Framework - Scope

- Framework defines architecture views:
  - Operational
  - Systems
  - Technical Standards
  - "All View" Products



- Each view is composed of sets of architecture information that are depicted via graphics, tables, or textual products

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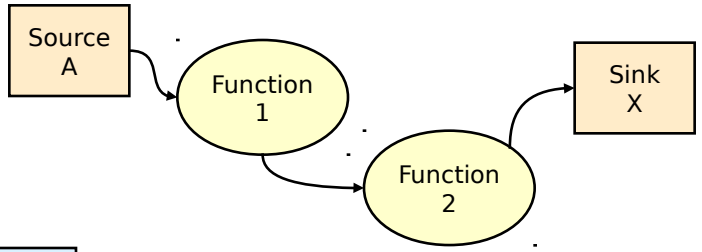
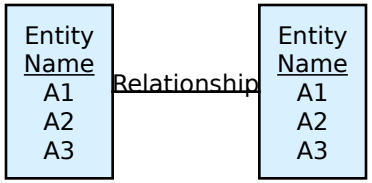
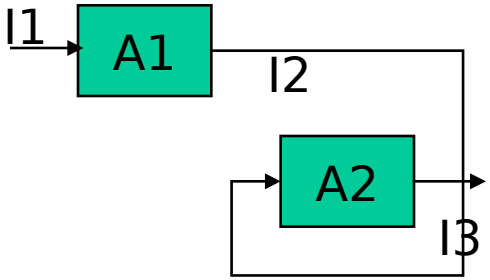
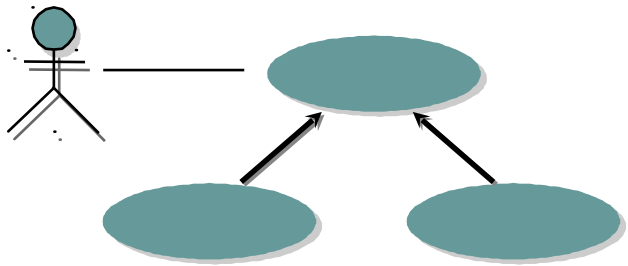
Architecture is Documented using Models









A Model is worth 1000 pictures

DoD Framework Products (Format of Products)

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OPERATIONAL (OV)

- High-Level Operational Concept Graphic
- Operational Node Connectivity Description
- Operational Information Exchange Matrix
- 4: Organizational Relationships Chart
- 5: Operational Activity Model
- 6a: Operational Rules Model
- Operational State Transition Description
- c: Operational Event/Trace Description
- 7: Logical Data Model

SYSTEMS (SV)

- 1: Systems Interface Description
- 2: Systems Communications Description
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- 11: Physical Data Model

TECHNICAL (TV)

- 1: Technical Standards Profile
- 2: Technical Standards Forecast

ALL (AV)

- Overview & Summary
- Integrated Dictionary

CADM: Core Architecture Data Model

Spreadsheets | Static Models & Graphics | Text | Dynamic Models

DoD Framework Products (Format of Products)

U.S. AIR FORCE

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Architecture Example: Aerospace Operations

- **Why AOC?**
  - **Unclassified—FOUO**
  - **Complex environment**
- **Background**
  - **The AOC is the JFACC's weapon system for command & control of air and space forces**
  - **Closely coordinated acquisition between ESC and AFC2ISRC**

DoD Framework Products (Format of Products)

U.S. AIR FORCE

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Text

AV-1: Overview and Summary Information

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Aerospace Operations Center
Weapon System AN/USQ-163

Block 10.1 (FY04-06)
Architecture
Version 1.0

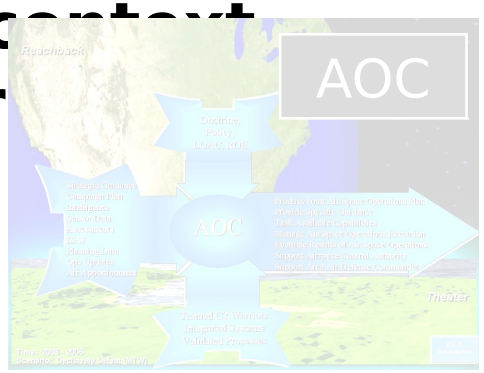
Overview and Summary Information
All View (AV) - 1

Electronics Systems Center (ESC/AC-OL-L)
Systems and Technical Architecture Team (STAT)
Langley AFB, VA

1 January 2003

- **Narrative description**
- **Overarching document guiding the architecture effort**
- **Defines scope, purpose, uses, analysis method, assumptions, products, c**
ools and r

Read First



Text

AV-1: Overview and Summary Information

Identification

- **Architecture Title:** Aerospace Operations Center (AOC) Block 10 *(Simplified Example)*
- **Architects:** ESC, AFC2ISR Center, and AFIT

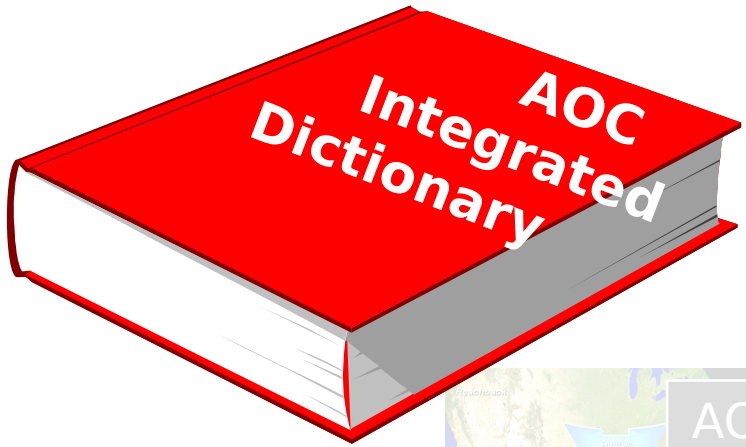
Purpose

- **Problem Description:** AOCs have not previously been baselined; units created their own AOCs according to various local methods and designs; AOCs were not a standardized, integrated weapon system.
- **Purpose:** AOC Block 10 sets a baseline ***"as is"*** architecture for a generic AOC; this supports ongoing AOC efforts, including contract RFP, weapon system integration and test, and future AOC development.
- **Scope:** This architecture depicts the evolution of a generic AOC and details the AOC high-level activities and major information exchanges.

Text

AV-2: Integrated Dictionary

- Glossary with definitions of terms used in the architecture
- Each item in the architecture should have a corresponding entry
- Dictionary should cross-reference all items



DoD Framework Products (Format of Products)

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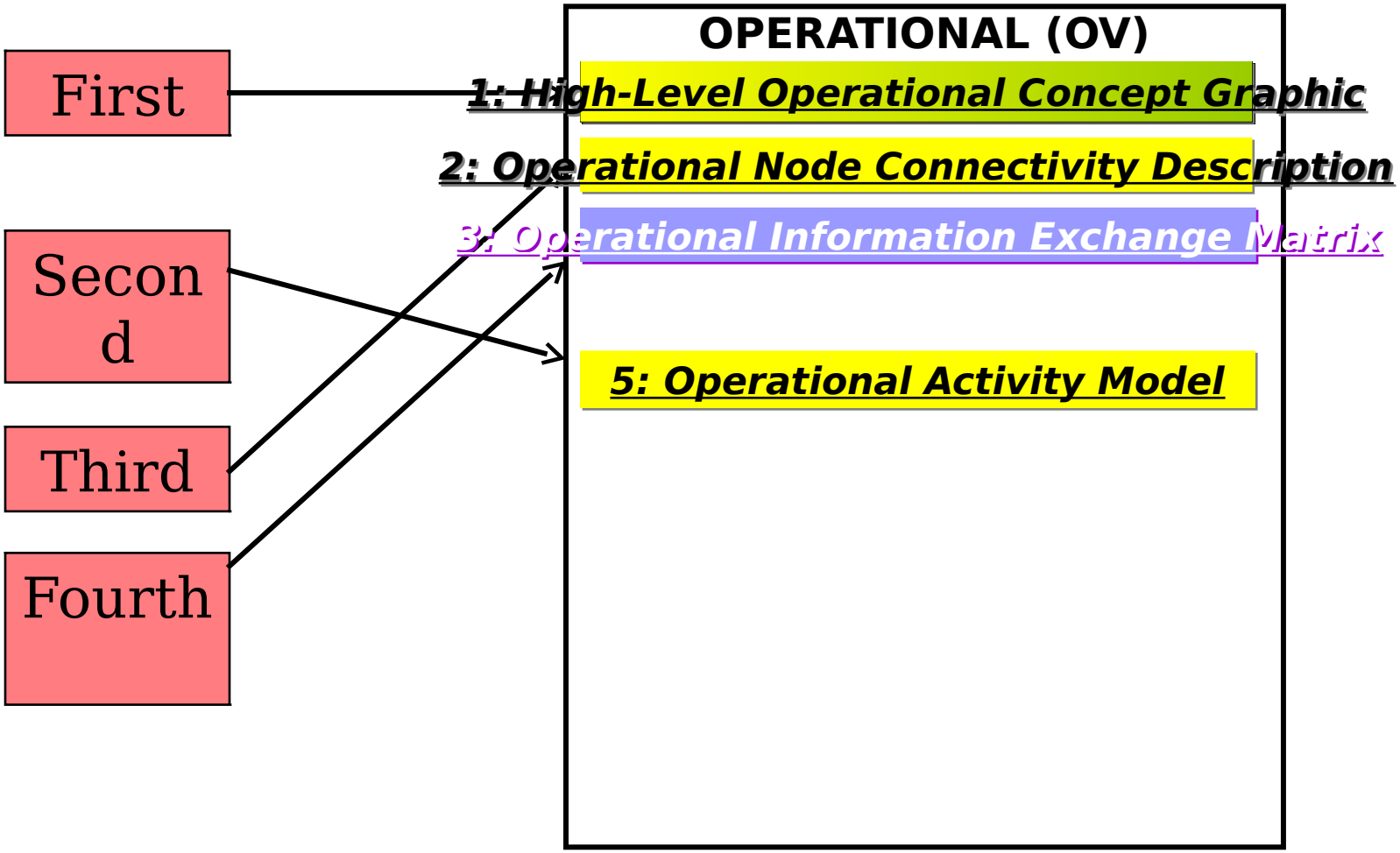
Operational Views Development Sequence



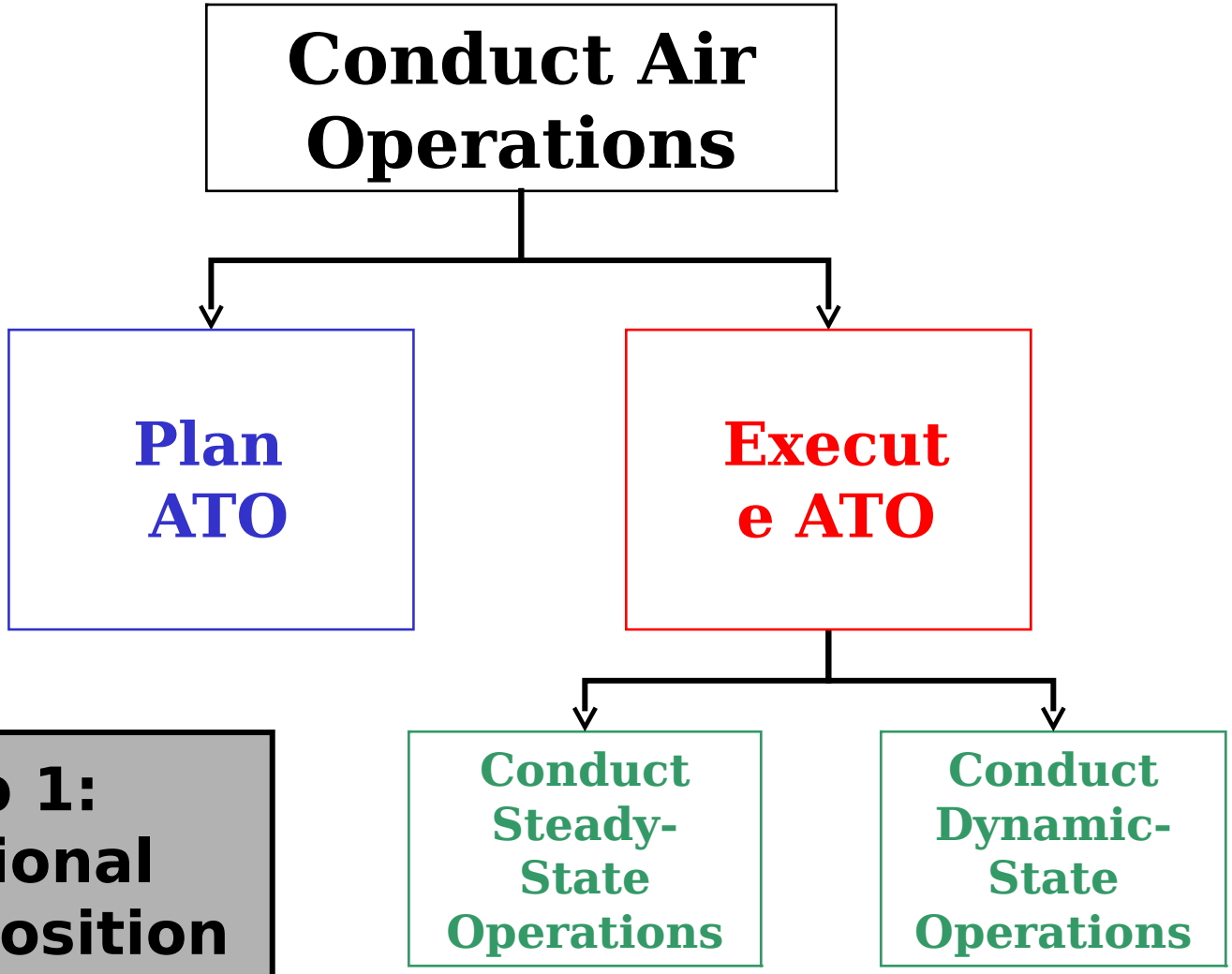
Graphics & Text

OV-1: High-level Operational Concept Description

- Depicts AOC operational concept (key inputs, outputs, controls, and mechanisms)
- Provides text description of the **ConOps**
- Marketing brochure or “Archi-toon”

Static Models & Graphics

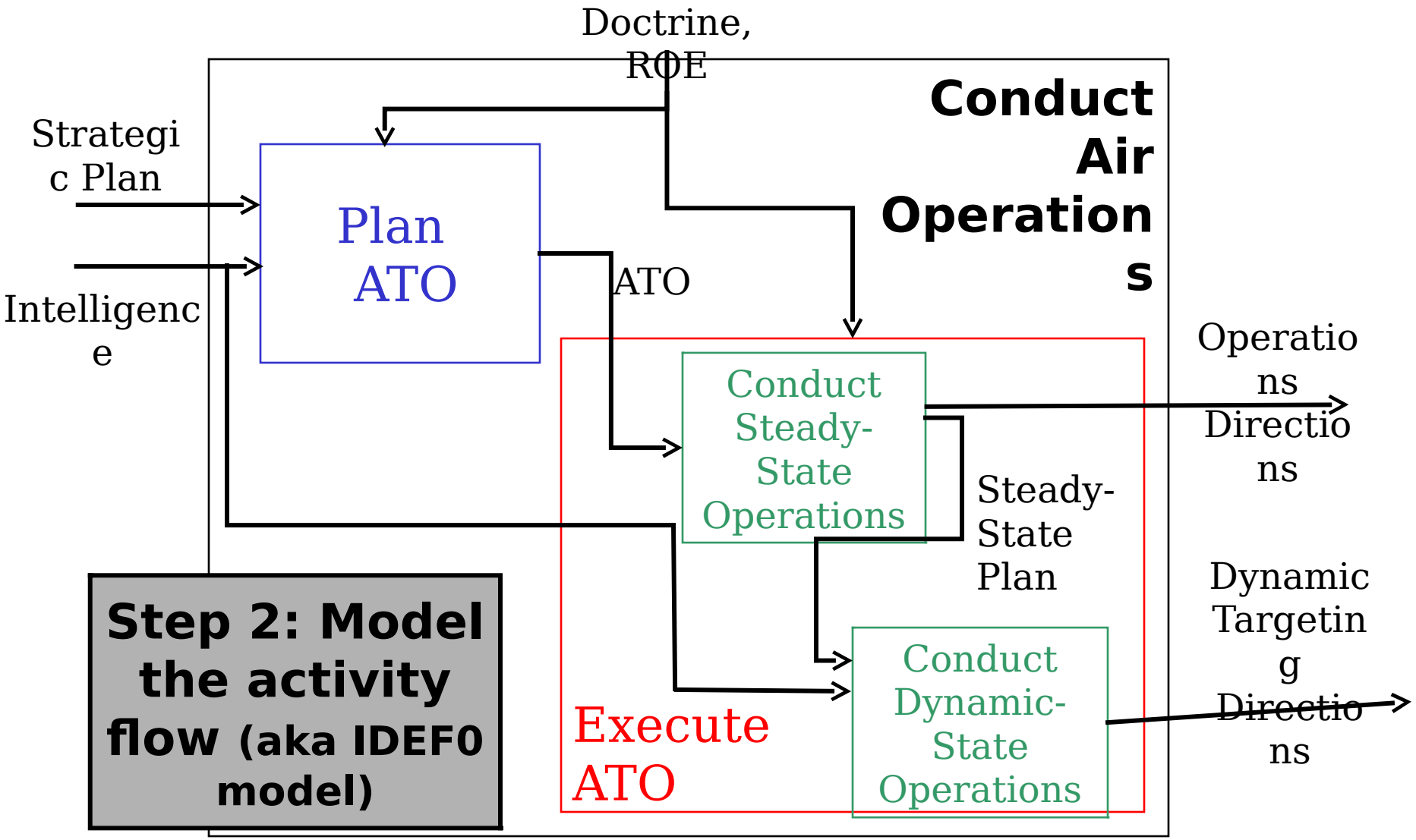
OV-5: Operational Activity Model



Step 1: Functional Decomposition
(structured similar to WBS)

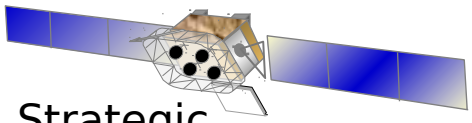
Static Models & Graphics

OV-5: Operational Activity Model



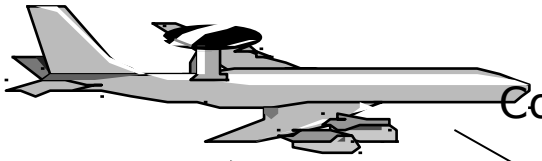
Static Models & Graphics

OV-2: Operational Node Connectivity Description



Strategic Reconnaissance (Big Bird)

Tactical Reconnaissance (Predator)



Airborne Command & Control (AWACS)

Shooter

Strat Intel

Tac Intel

Air Intel

Operations Directions

Dynamic Targeting Directions

Note: "As Is" Architecture

Theater HQ

rategic Plan

Air Operations Center

ATO Planning Cell

ATO

ATO Execution Cell

OV-2 depicts nodes and high-level information flow (needlines)

Spreadsheet

OV-3: Operational Information Exchange Matrix

NEED LINE	INFORMATION EXCHANGE	SENDING NODE	SENDING ACTIVITY	RECEIVING NODE	RECEIVING ACTIVITY
HQ to AOC	Strategic Plan	HQ	Disseminate joint forces battle plan	AOC	Convert Strat Plan into ATO
Strat Recon to AOC	Strat Intel	Strat Recon	Disseminate strategic imagery	AOC	Target strategic targets
Tac Recon to AOC	Tac Intel	Tac Recon	Disseminate tactical imagery	AOC	Target tactical targets
AOC to Airborne C2	Operations Directions	AOC	Coordinate steady-state battle plan	Airborne C2	Control air battle
AOC to Airborne C2	Dynamic Targeting Directions	AOC	Coordinate dynamic battle plan	Airborne C2	Control air battle
Airborne C2 to AOC	Airborne Intel	Airborne C2	Relay air battle picture	AOC	Coordinate air battle

DoD Framework Products (Format of Products)

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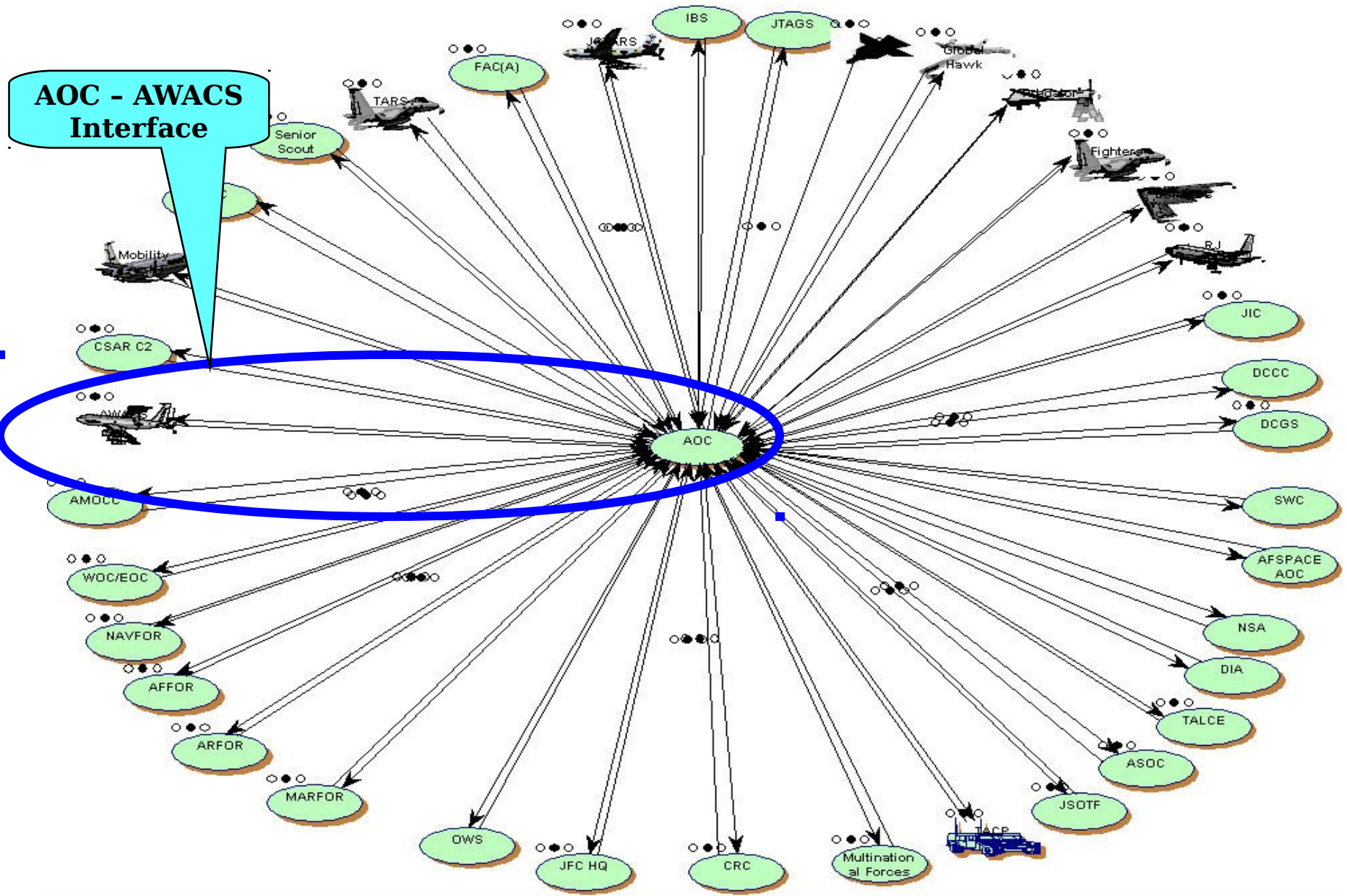
Spreadsheets | Static Models & Graphics | Text | Dynamic Models

Static Model

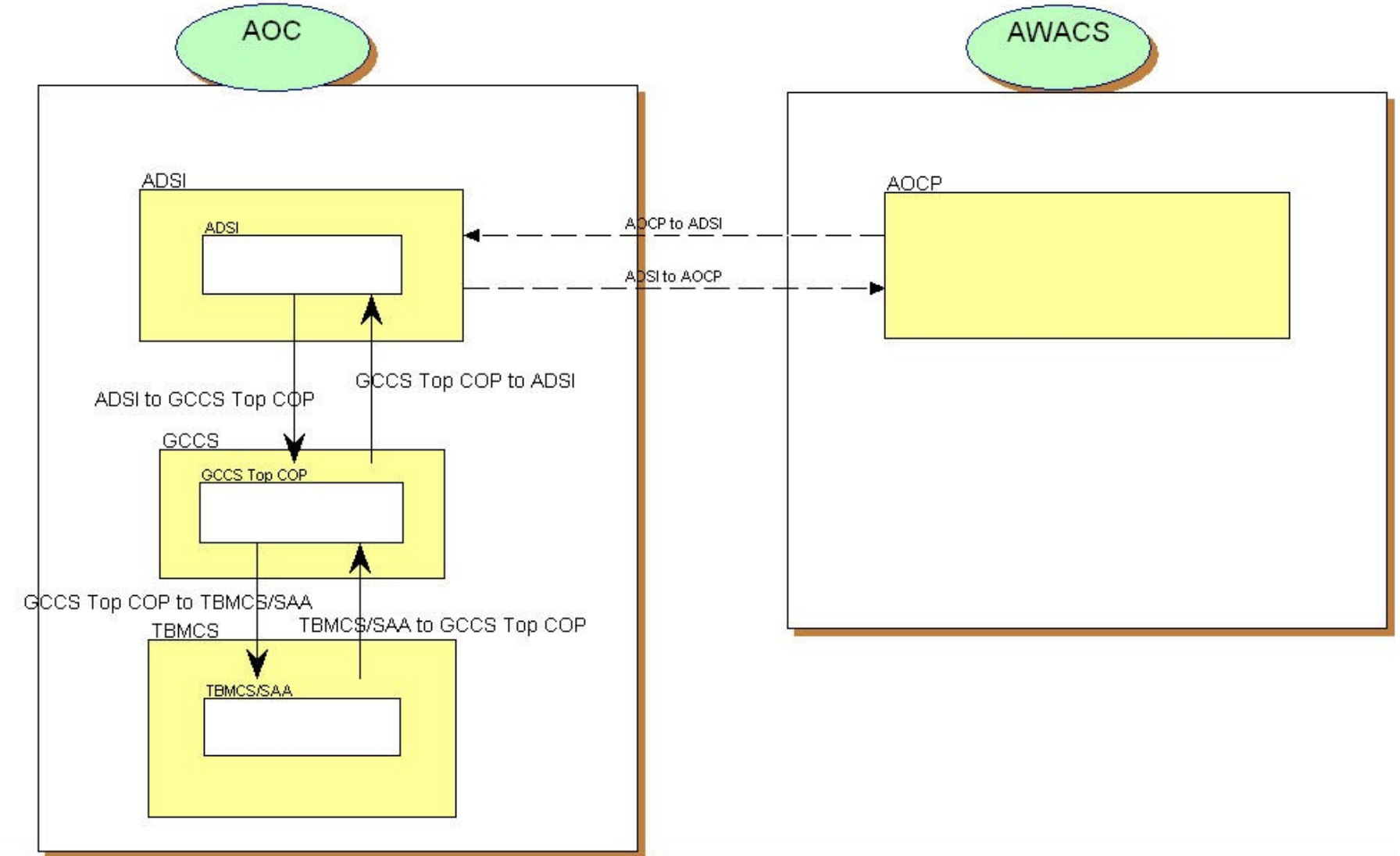
SV-1: System Interface Description



Static Model

SV-1: System Interface Description

Note: For demonstration purposes, this chart depicts only the AOC and AWACS systems. (Other system nodes not shown)



Static Model

SV-2: System Communication Description

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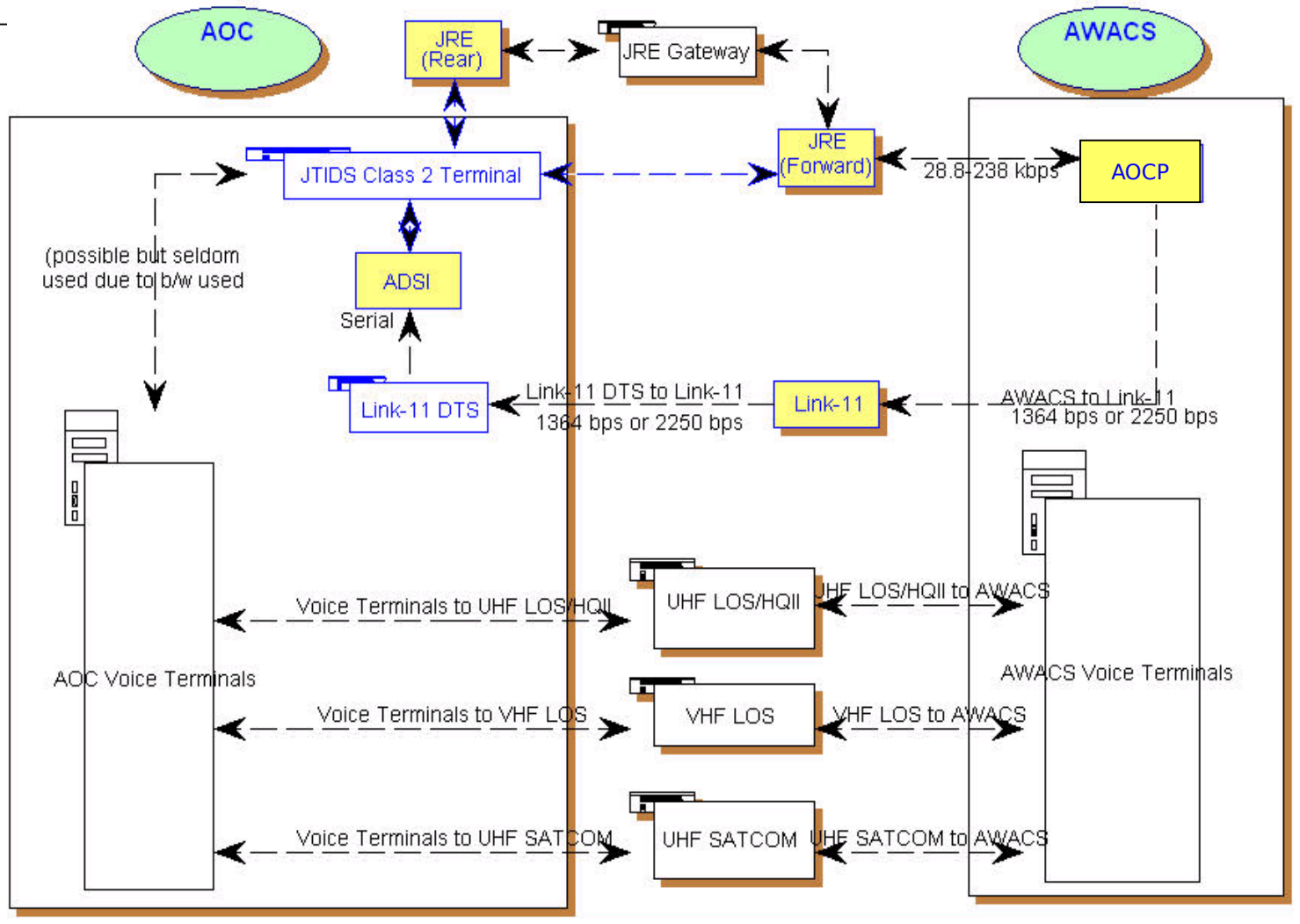

Static Model

SV-6: System Data Exchange Matrix

SYSTEM DATA EXCHANGE	SENDING SYSTEM	RECEIVING SYSTEM	MEDIA	FORMAT	PROTO-COLS
Mission Data	AOC Data Terminal System	AWACS Data Terminal System	Manual Keypad entry	Manual	Manual Keypad entry
Bombing Target Coordinates	AWACS Data Terminal System	AOC Data Terminal System	Network or RS-232 Serial	Tactical Data Intercom-puter Msg Format	TDIMF
Air Suppression Request	AOC Voice Terminal System	AWACS Voice Terminal System	VHF Radio	Voice	Voice Radio Protocol
Airborne Target Coordinates	AOC Data Terminal System	AWACS Data Terminal System	Network or RS-232 Serial	Receive Only Cyclic Transaction	Ethernet Socket-J Protocol (TCP/IP)

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Spreadsheets | Static Models & Graphics | Text | Dynamic Models

Spreadsheets

TV-1: Technical Standards Profile

C4ISR Domain	
AOC Service	**Standard**
FireWire	IEEE Std 1394-1995; IEEE Standard for a High Performance Serial Bus; December 2002
Symbology	MIL-STD-2525B; Common Warfighting Symbology; 30 January 1999
Global Positioning System	ICD-GPS-225A; NAVSTAR GPS Selective Availability-Anti-spoofing Host Application
Authentication Security Standards	FIPS PUB 112; Password Usage; 30 May 1985.

DoD Framework Products (Format of Products)

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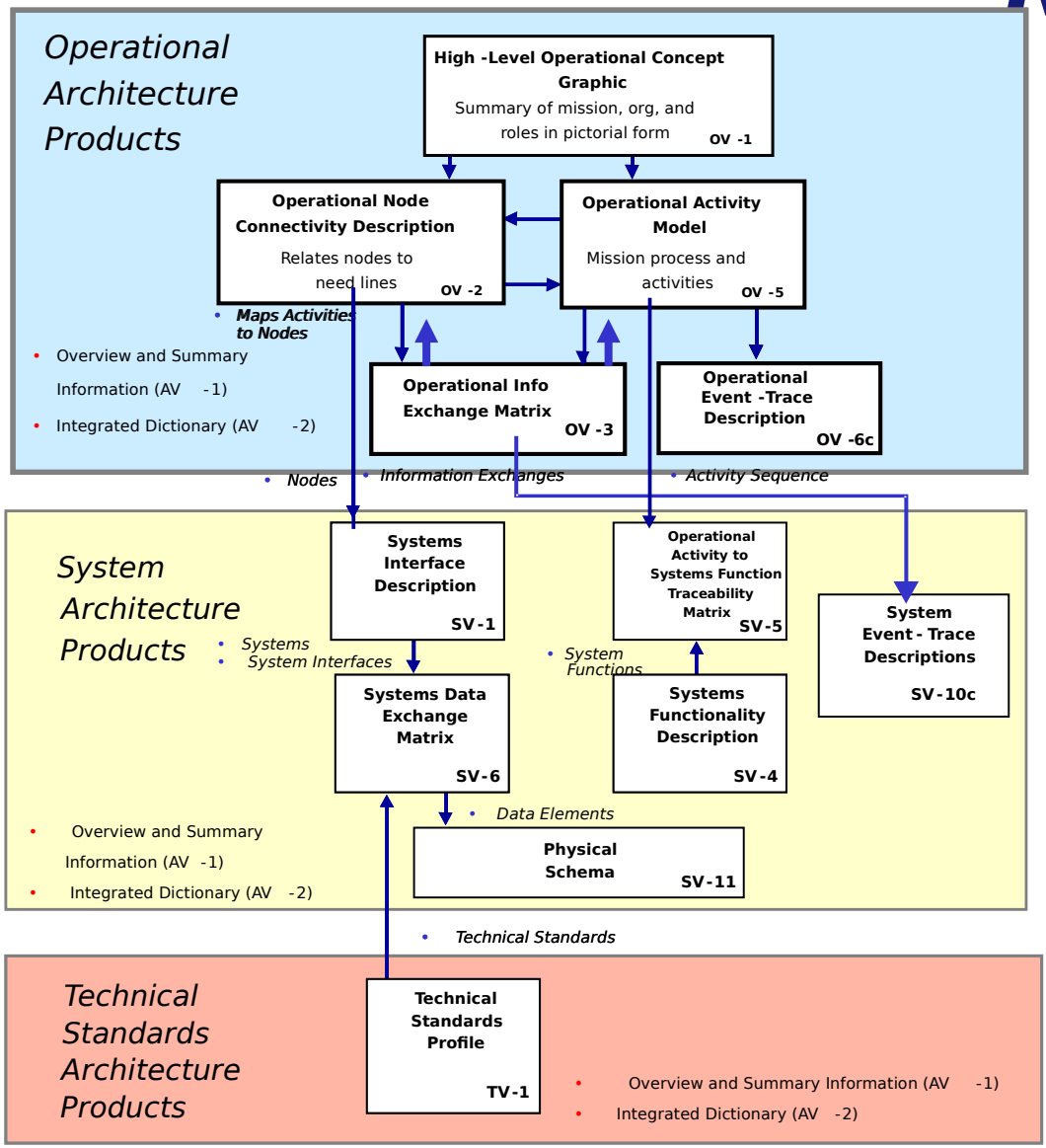
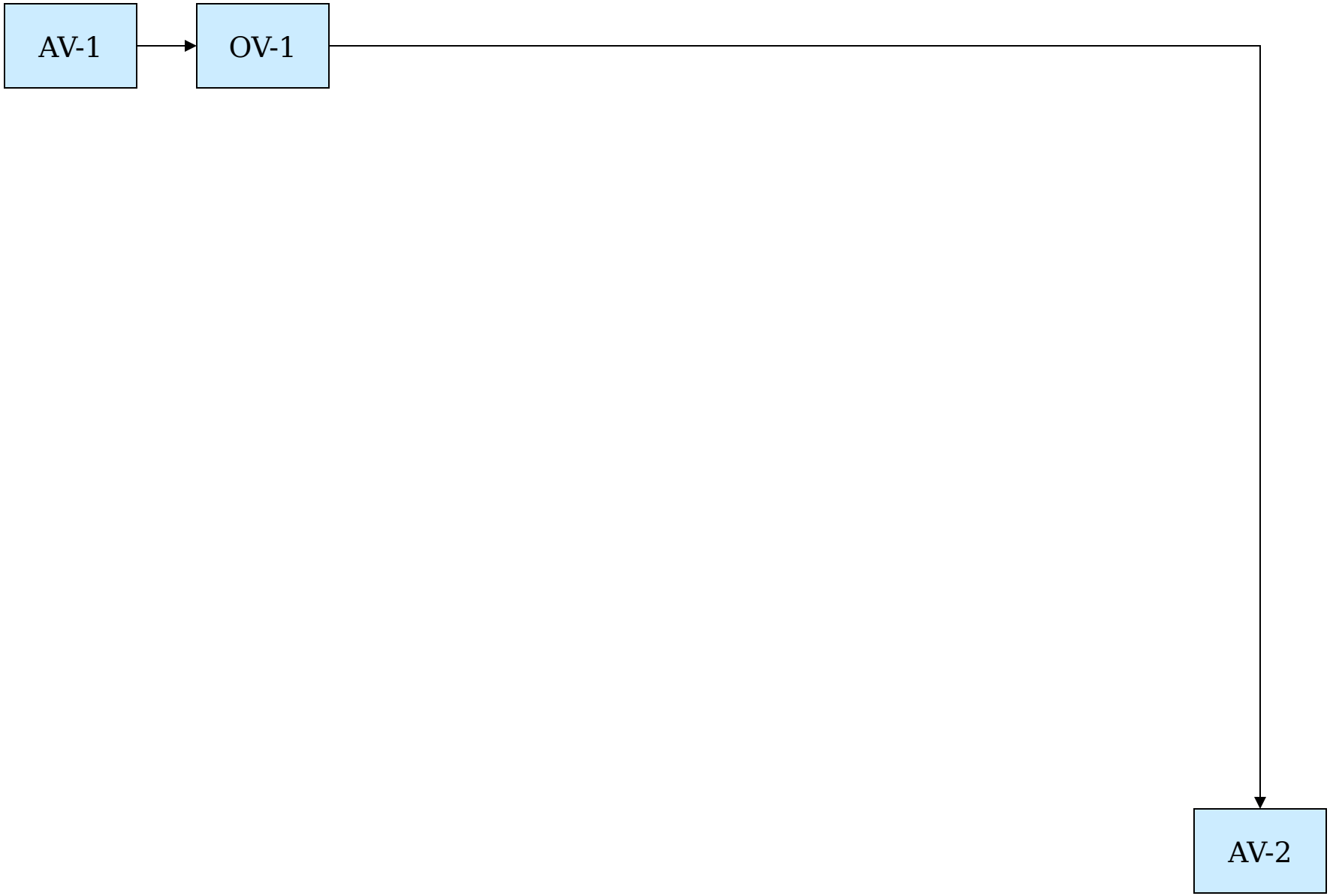
Architecture Product Relationships



Integrated Architecture (as described by Joint Staff/J8)

SEQUENCE OF PRODUCTS (from AMC)



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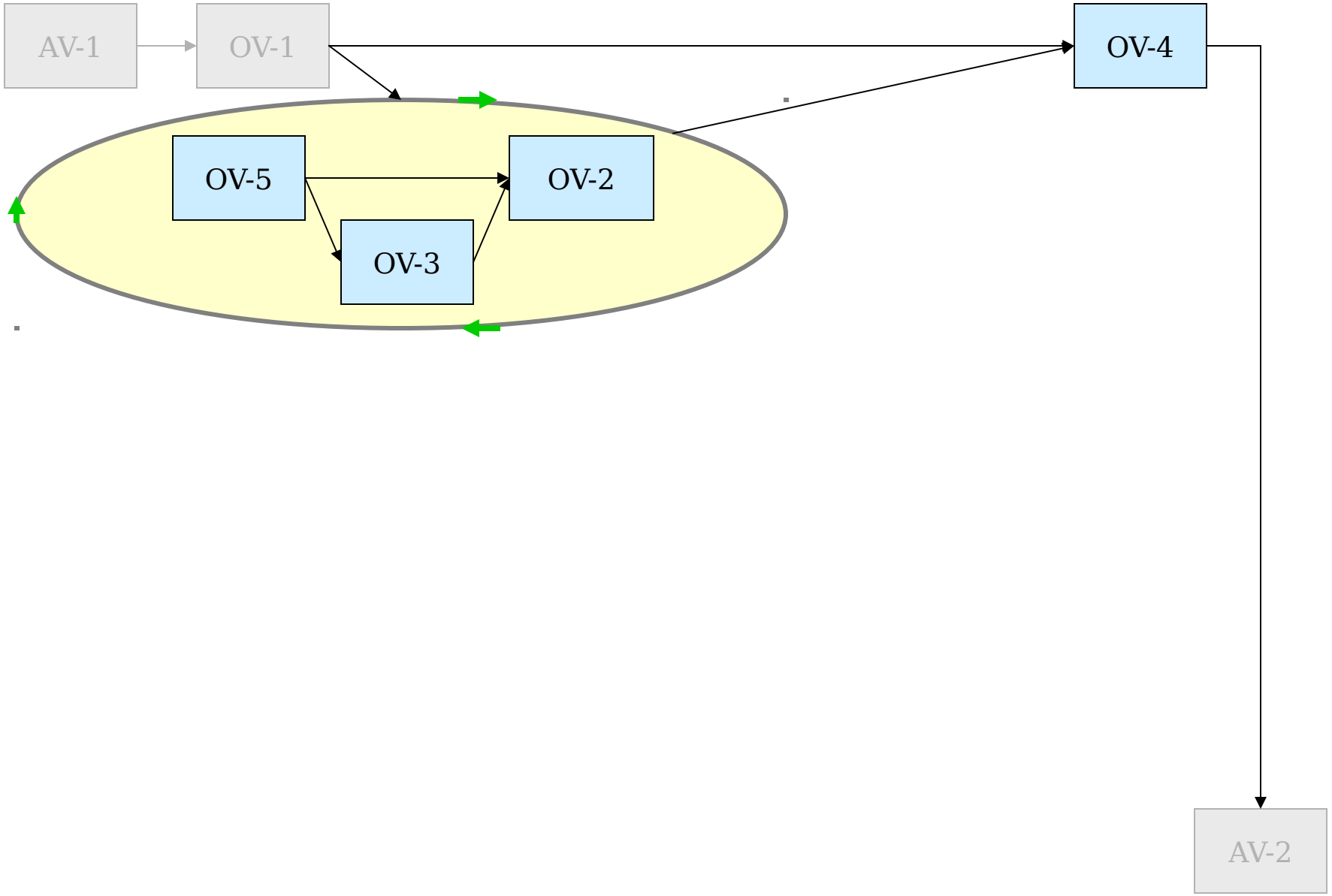
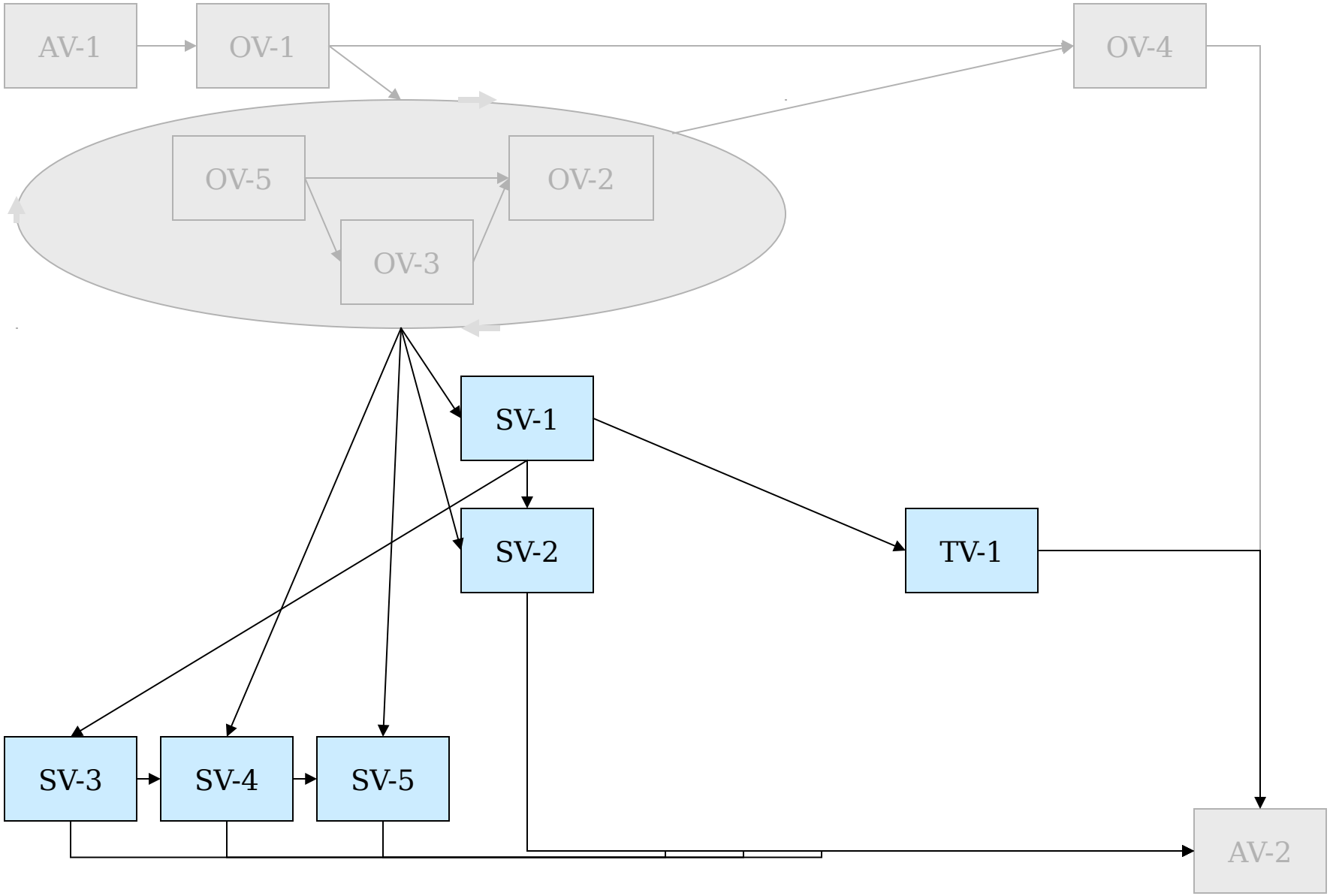


SEQUENCE OF PRODUCTS (from AMC)



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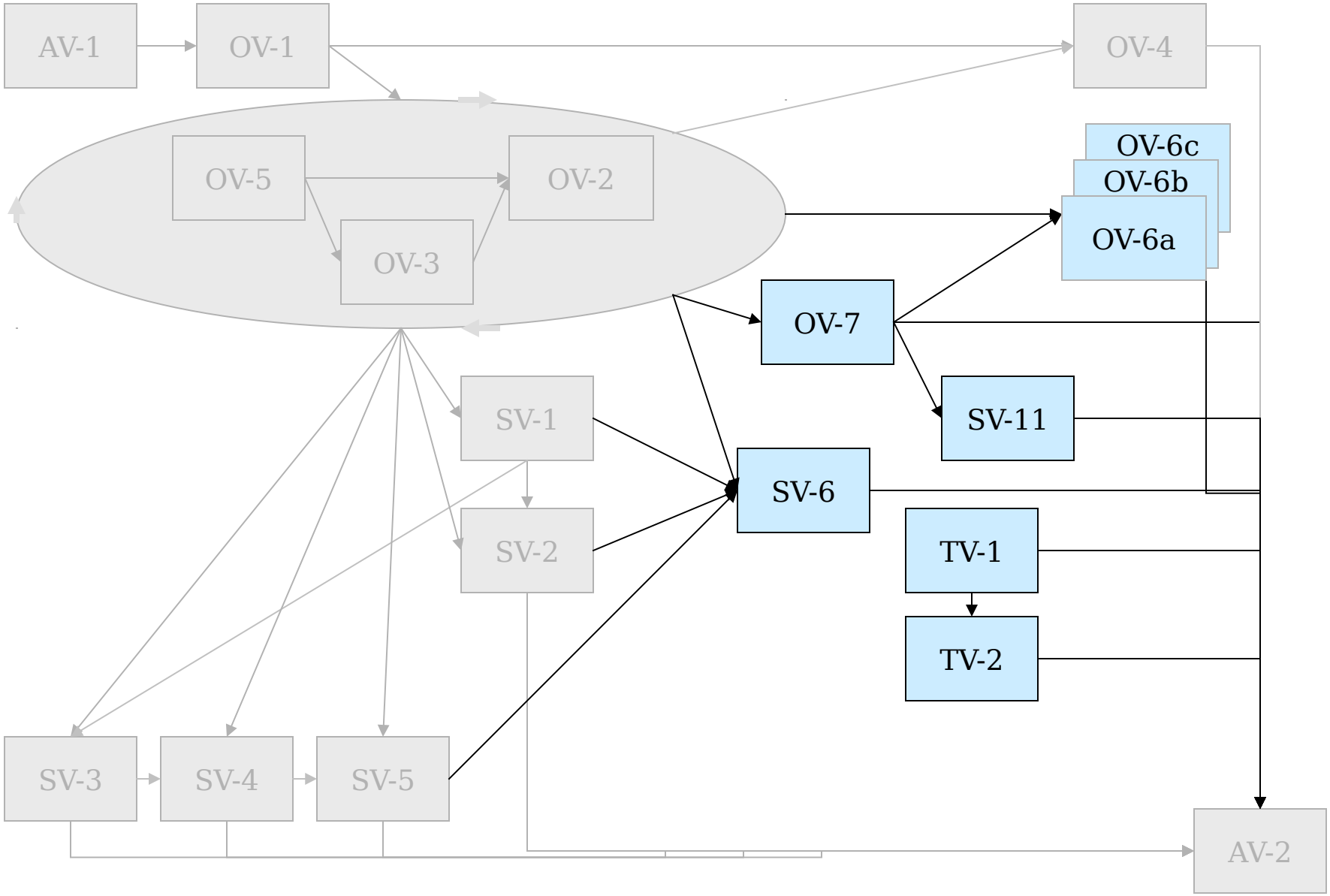
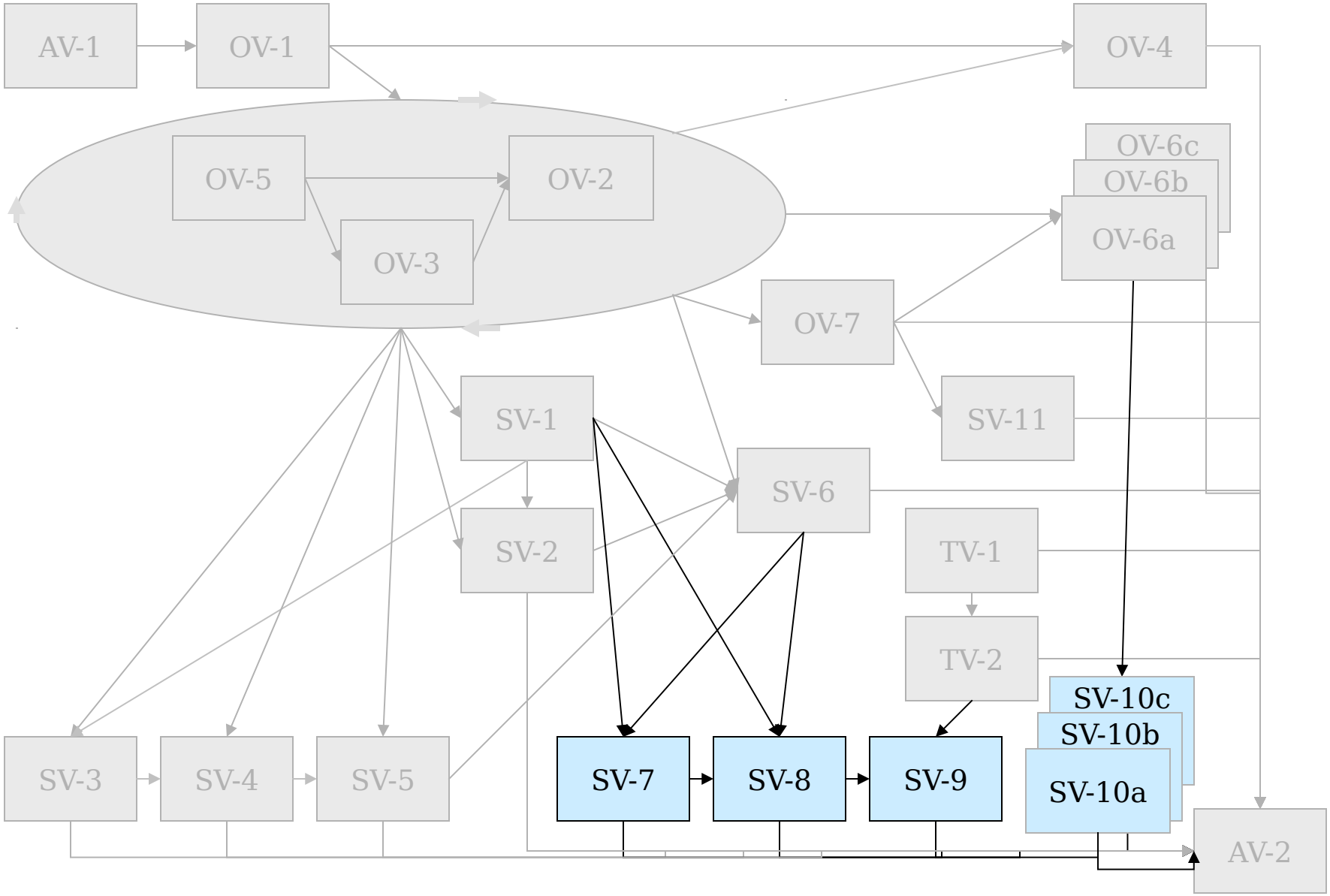
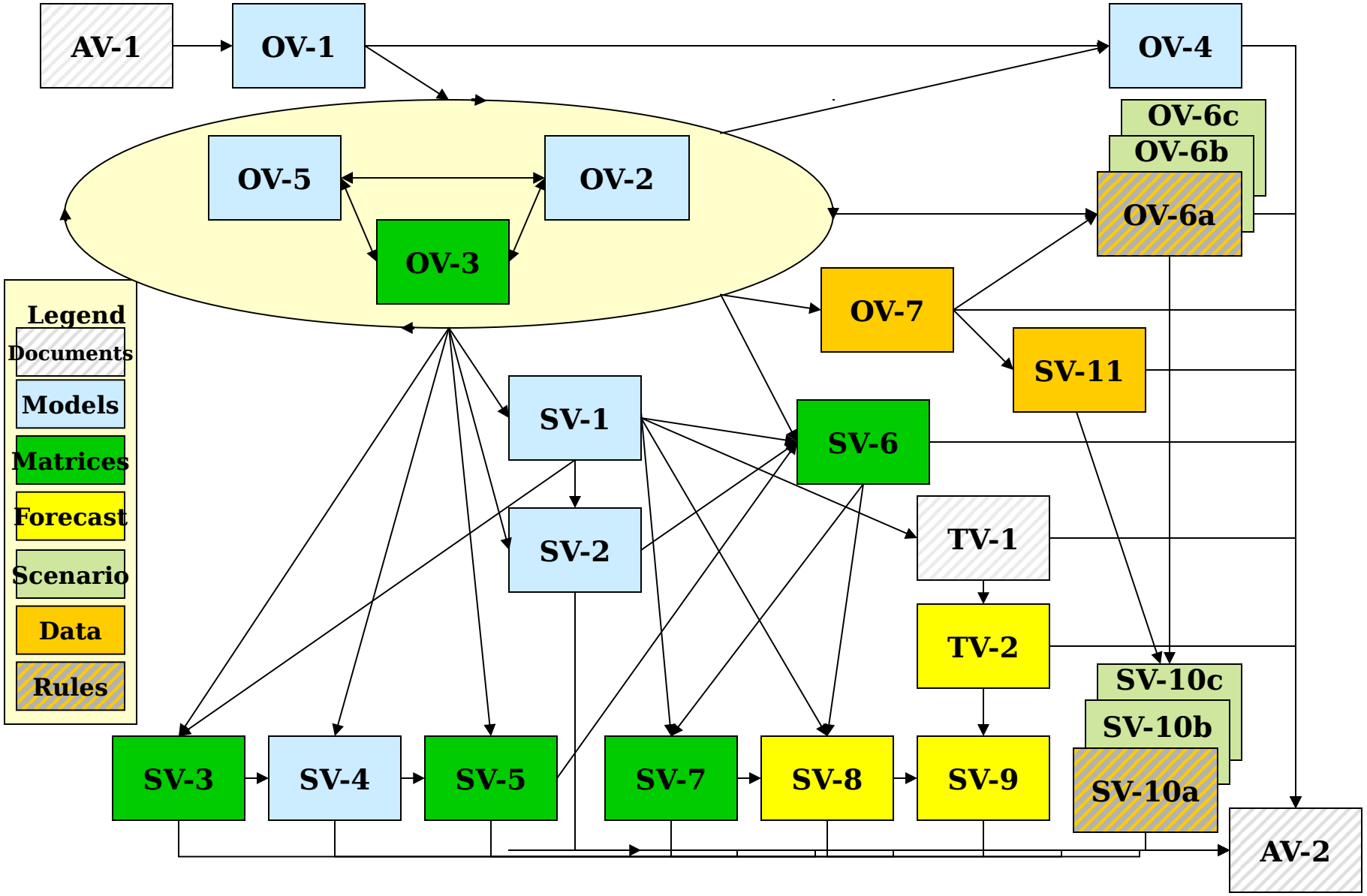


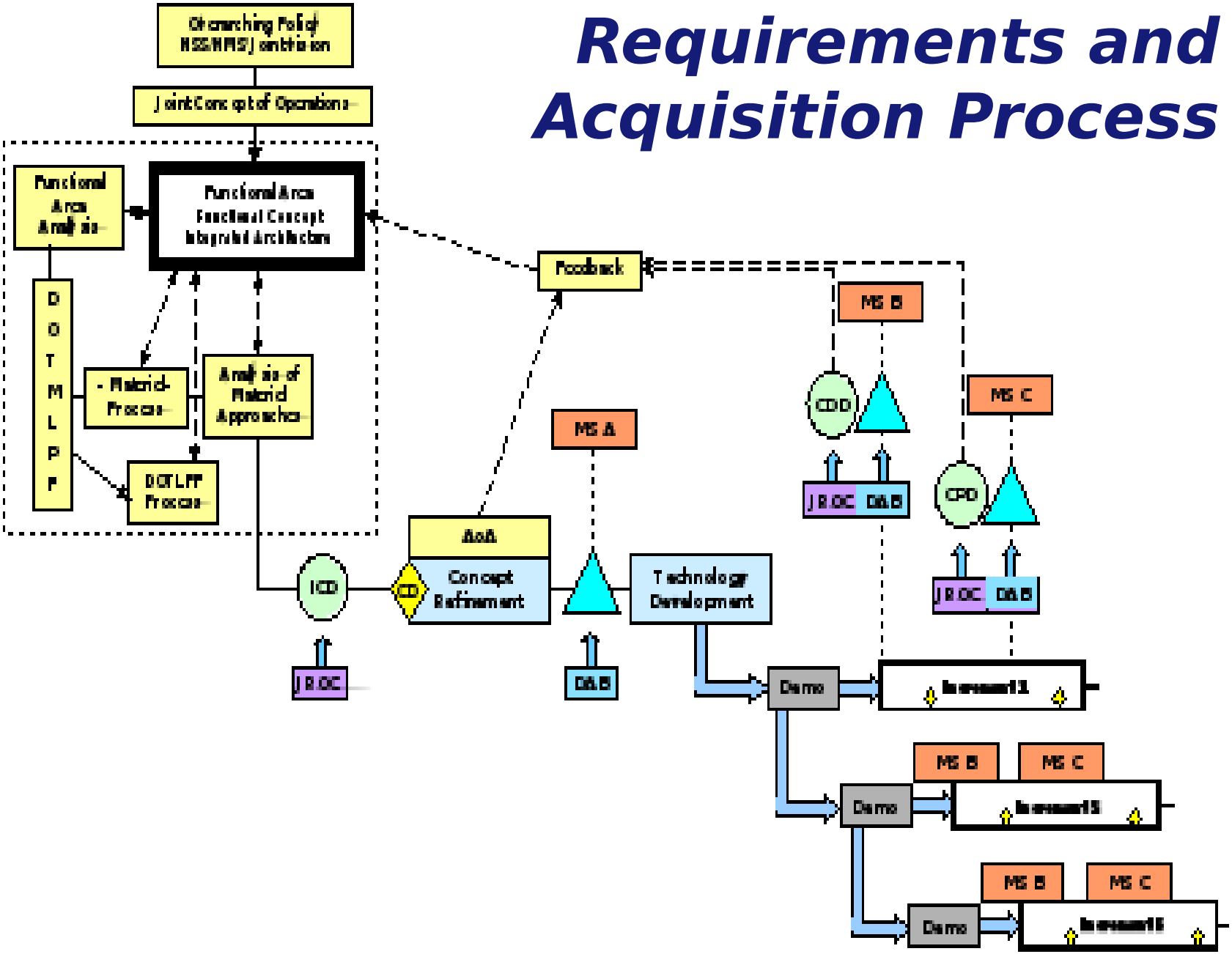
SEQUENCE OF PRODUCTS (from AMC)



DoD Framework Products



Requirements and Acquisition Process

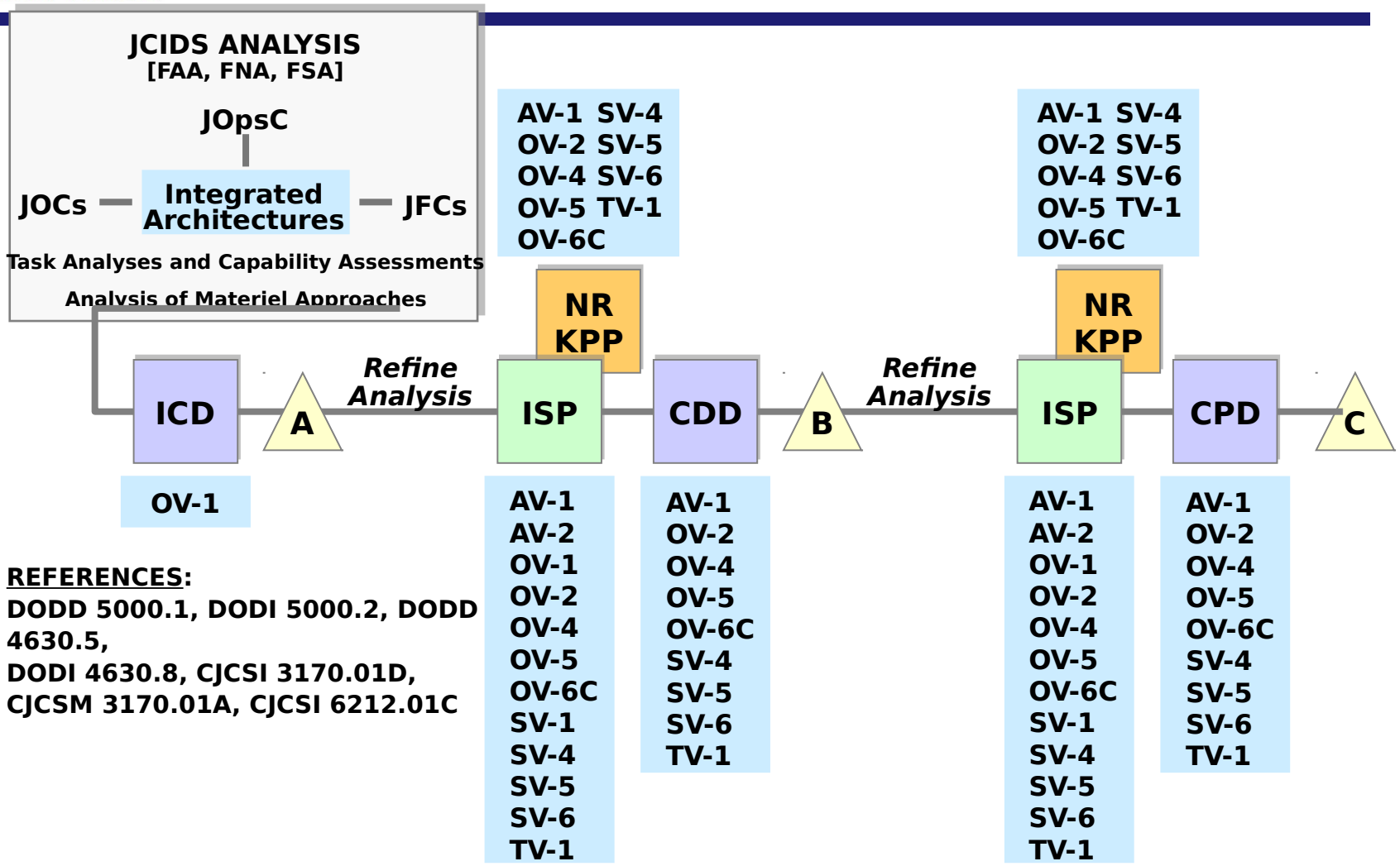


CJCSI 3170.01D Architecture Elements Summary

ORD Architecture Elements:	ICD Minimum Architecture Elements:	CDD Minimum Architecture Elements:	CPD Minimum Architecture Elements:
1. OV-1	1. OV-1	1. AV-1	1. AV-1
2. OV-3		2. OV-1	2. OV-1
3. SV-1		3. OV-2	3. OV-2
		4. OV-4	4. OV-4
		5. OV-5	5. OV-5
		6. OV-6C	6. OV-6C
		7. SV-4	7. SV-4
		8. SV-5	8. SV-5
		9. SV-6	9. SV-6
		10. TV-1	10. TV-1

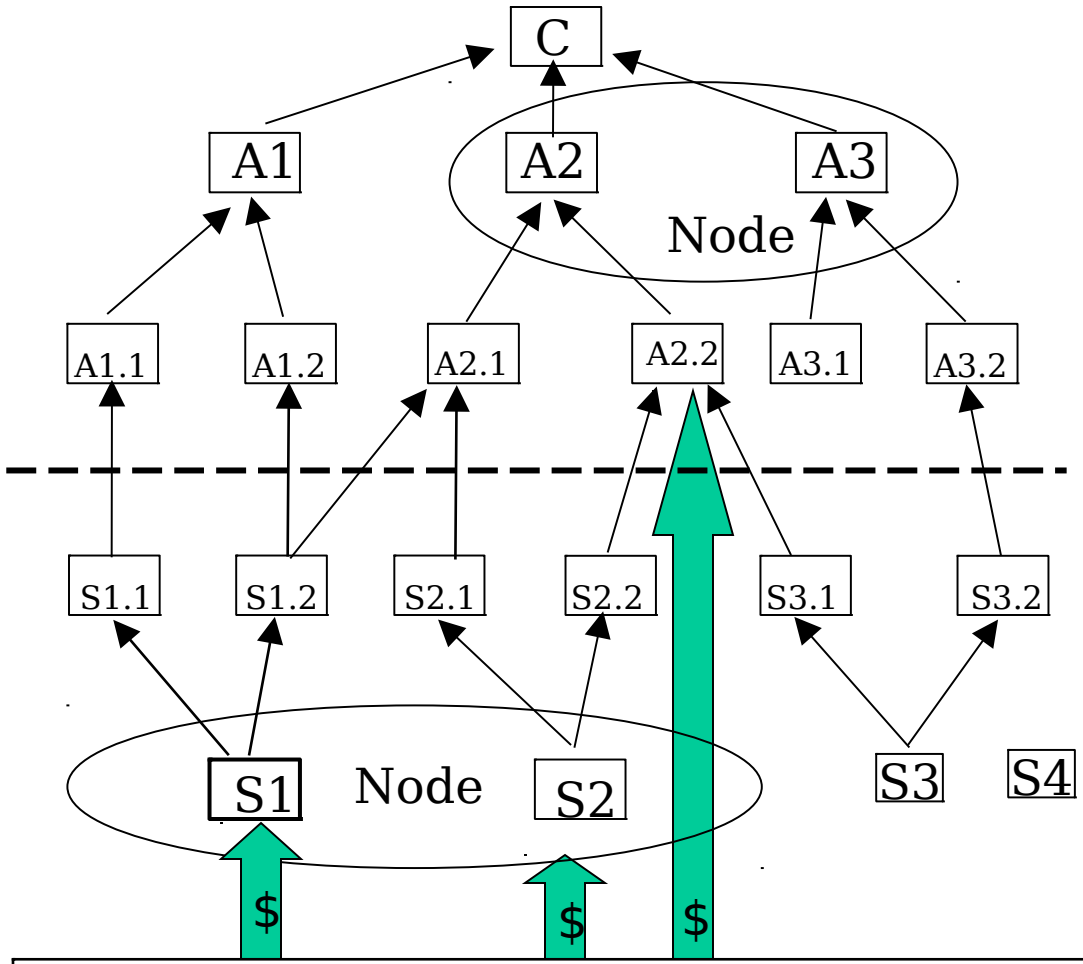
CJCSI 3170.01D Architecture Elements Summary

U.S. AIR FORCE



REFERENCES:
DODD 5000.1, DODI 5000.2, DODD 4630.5,
DODI 4630.8, CJCSI 3170.01D,
CJCSM 3170.01A, CJCSI 6212.01C

Architecture & Capabilities



Capability

Nodes

Activities

Functions

Systems

OVs

SVs

$ for Acquisition, Personnel, TTP Changes,…

$/PEs

Financial Data

https://afkm.wpafb.af.mil
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